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(54) Chain belt for scraper conveyors

(57) A chain belt for scraper conveyors, in particular in underground operations, in which a chain belt consisting of one or several parallel round link chains (1,2), Fig. 3, pushes the output material with multipart scrapers, which surround at least one horizontal connecting member of each round link chain and lock it in position by engagement of their parts, the connecting member comprising two interlocking parts (33,34) Fig. 2, which are located and held in cooperating channels (45,46 and 47,48) in the respective scraper parts (8,9), Fig. 1. The scraper parts are clamped together by bolts (12).

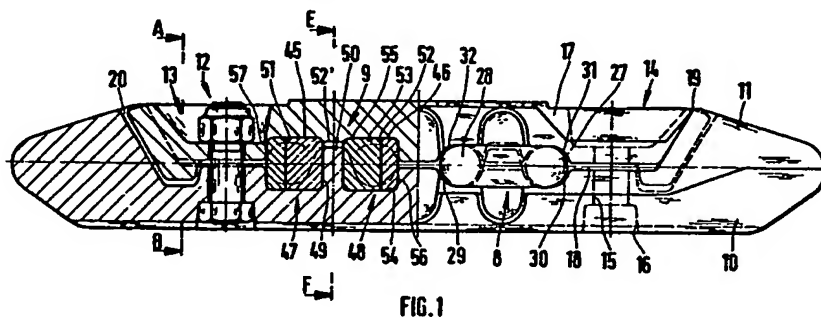


FIG. 1

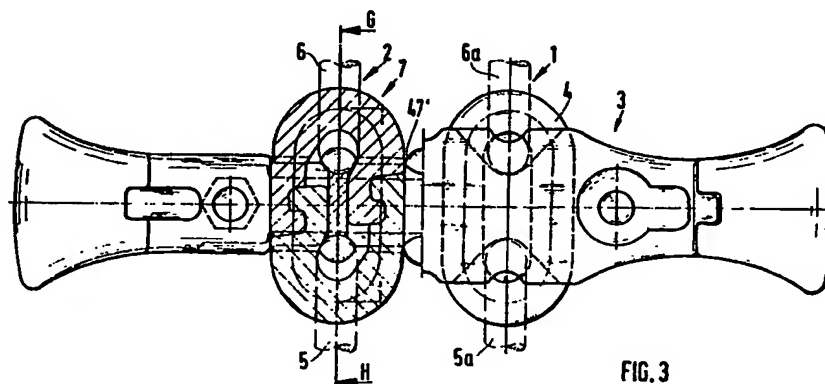


FIG. 3

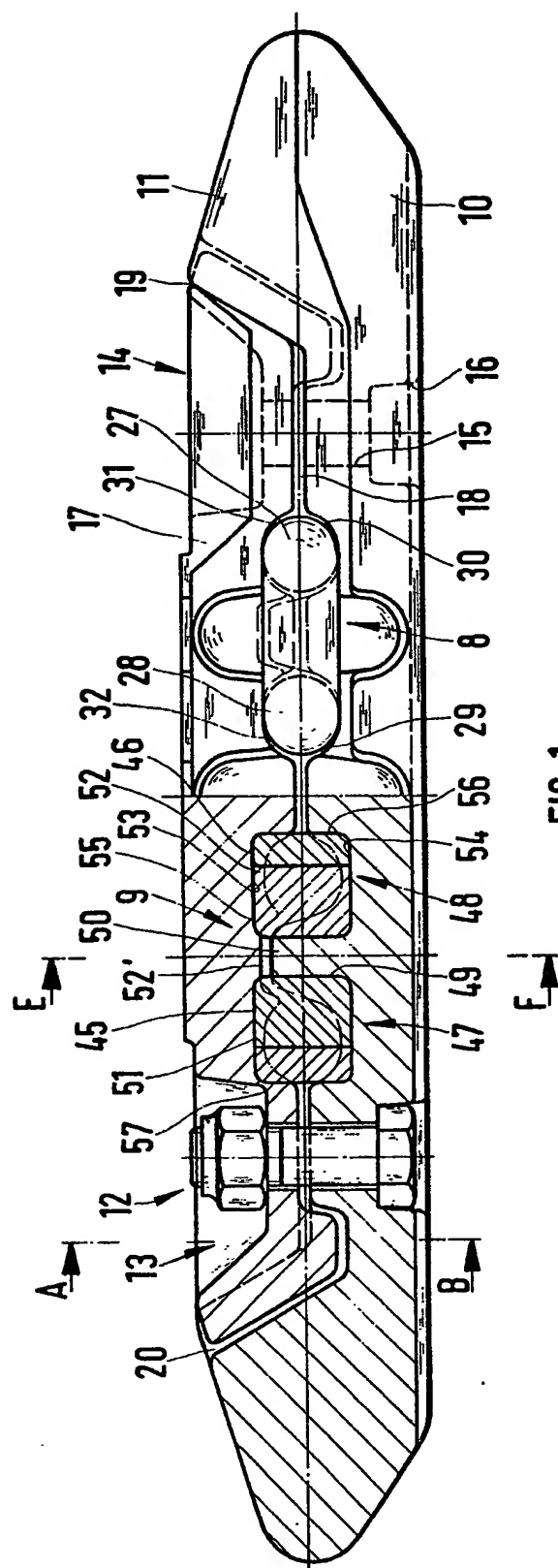


FIG. 1

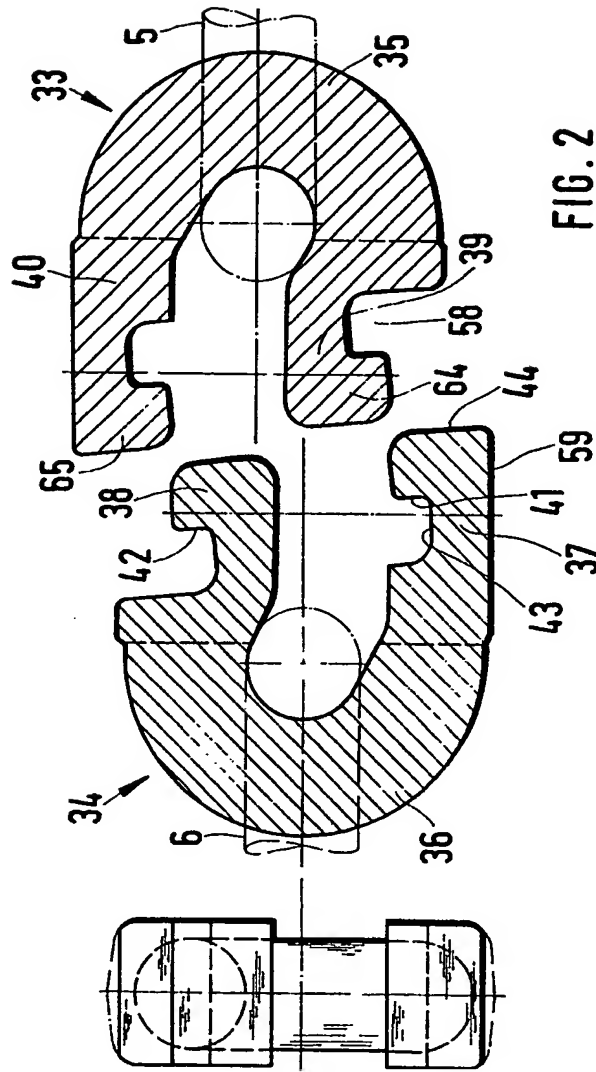


FIG. 2

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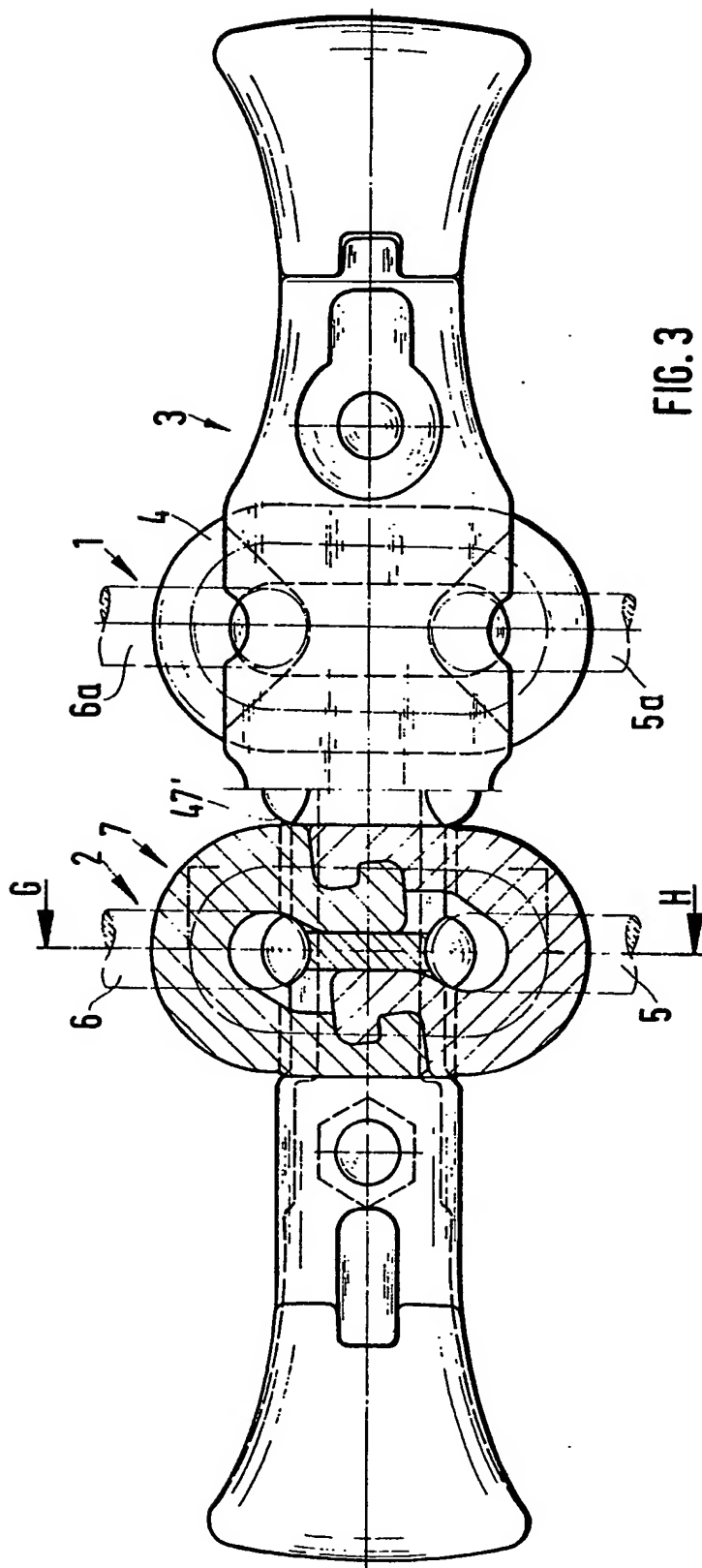
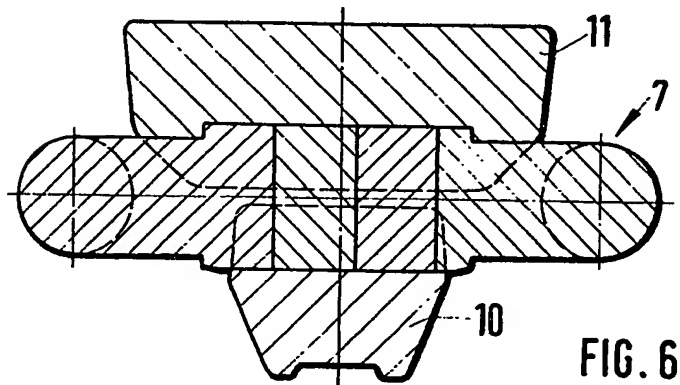
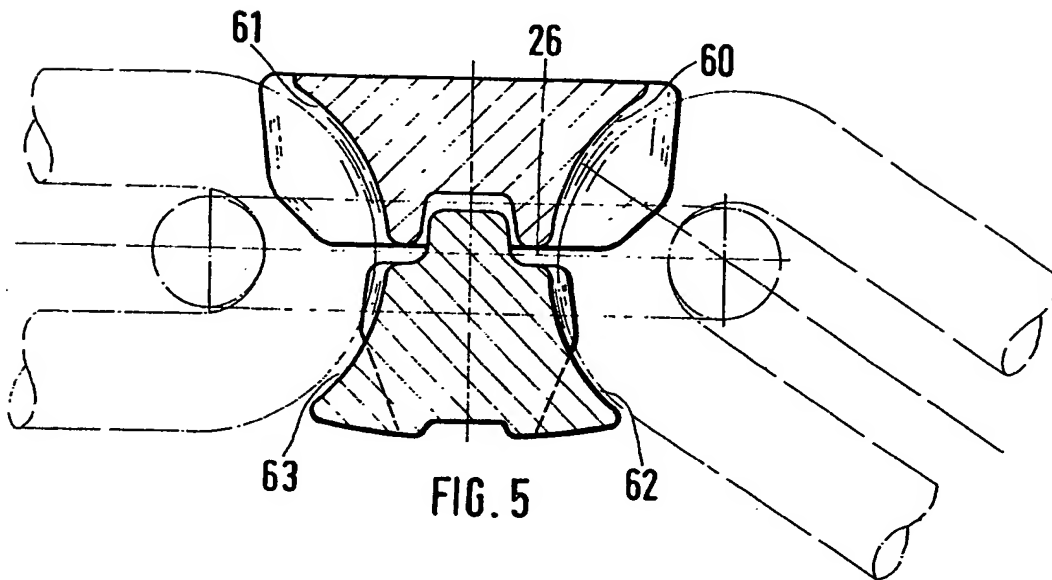
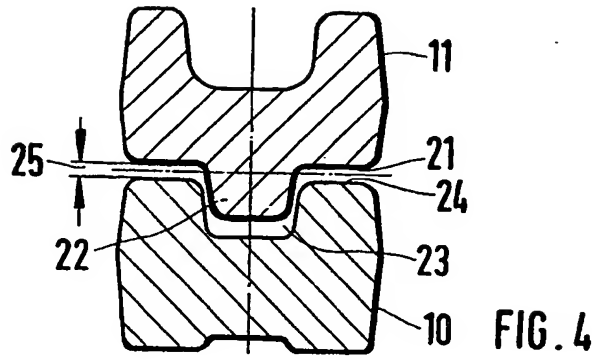


FIG. 3



SPECIFICATION

Chain belt for scraper conveyors

- 5 The invention relates to a chain belt for scraper conveyors, in particular for underground operations, in which one or several parallel round link chains push the output material with multipart scrapers, which surround at least one horizontal connecting member of each round link chain and lock in position by screw engagement of their parts, comprising one component having a rounded member and the shanks connected thereto with a part of their length, and a congruent further component, and which is housed in a chain bed formed in the horizontal joint faces of the scraper parts, which has channels which liberate the rounded members of the components, which are suspendable with each of their shank connections into a chain end member of a chain strand, according to the flexibility of the suspended vertical chain end members.

- The underground performance of such scraper conveyors necessitates a robust and simple method of construction which in chain belts, above all, concerns the scrapers and their connecting chain members. Although the channel track in which the chain band, driven over the chain drum wheels, revolves continuously, and thereby moves the delivered material forwards scraping on the channel floor with its scraper bars, need not only be horizontal but may also be inclined, the definition of the parts of such a conveyor is taken from the horizontal position of the channels and thereby distinguishes, inter alia, the horizontal and vertical chain members in the round link chains. The propelling forces of the chain belt transfer themselves with a round link chain. This is then arranged as a centre chain and thereby also makes possible bending of the chain belt when travelling over curves. Chain belts whose propelling forces do not only transfer themselves with one middle chain alone usually have double chains. These are arranged as centre chains symmetrically to the longitudinal axis of the chain belt, inter alia on the grounds of the said curved running or as outer chains, if the channel track is essentially straight and the space between neighbouring scrapers is not to be restricted by the chains. Such chain belts, have a considerable power requirement, whereby inter alia the scrapers and the connecting members are highly taxed. It is therefore necessary to connect the scrapers or connecting members with each other such that relative movements over long operational periods of the chain belt are prohibited. Such relative movements lead not only to rubbing abrasion of the bearing connection surfaces but also on the chain drum wheels so that the scrapers no longer plunge securely into the drum recesses and are therefore, inter alia, distorted, whereby they lose their

guideway in the channel track. On the other hand the scrapers must be manufactured for various reasons through recasting from blanks, which generally ensues through forging and necessitates manufacturing tolerances which admittedly only allow unnoticeable relative movements, but which as a result of the rubbing abrasion caused thereby quickly reach a dangerous level.

- 70 Due inter alia, to its length, the chain belt cannot be assembled from round link chains which consist of a penetrating chain strand. In general one uses chain strands which are essentially shorter than the whole chain length in order to reduce the transport weights and measurements of the round link chains to a practical level. These long strand chain belts have the advantage that the number of chain fasteners necessary for connection of the chain strand in the chain belt remains low, which makes possible a simple and therefore also secure construction of the chain belt, inter alia due to the operational effort in the chain fasteners. Therefore long strand chain belts are the preferred arrangement for application of the invention, which is however also utilisable on short strand chains which usually have a particularly constructed connection member for each scraper.

- 95 The implementation of multipart connection chain members to some or all scrapers leads to a simplification which essentially means that the connection chain members are only led horizontally over the chain drum wheels together with the scrapers. Chain fasteners are however difficult to locate correctly in the chain if they may only be directed in a specific place over the chain drum. If such chain fasteners fit horizontally and vertically into the recesses of the chain drum wheels, very complex parts arise from the high propelling forces, which at the same time frequently break down and lead to unpleasant chain breaks.

- 110 The invention stems from a known chain fastener (DE-PS 20 31 927) which transferred the chain strand connections into the connection chain members of the scraper such that these two could be housed next to each other in double centre chains in the scraper. In this way the two part fixtures at the screw couplings, which consist of two horizontally placed screws, have vertical joint faces of the scraper parts. In the region of the chain belt a spanning is therefore lacking, because the screw starting torque cannot become effective on the horizontal joint faces. Both parts of the connection chain member are each fixed in the chain bed, which for this reason has, in the middle of the chain channels respectively, an annular-shaped recess in the channel wall and the channel floor, into which at the shank ends of the components fit headed, plate-shaped projections. These projections necessary for the form-closure of the components

of the connection chain member with the scraper are limited in at least one dimension to the clear measurements of the inner space of the end member of the chain strand which can lead to break downs of the components, however always causes high surface pressure on removal of the chain propelling forces. Since the fixing of the components is lacking the tolerances lead to the above-described relative movements of the scraper parts and the components of the connection chain member with the result of an excessive abrasion which is also not balanced by the tightening of the screw coupling.

The object of the invention is to create in a chain belt of the known type, a robust construction, which ensures that breakdowns of the components from the relative scrapers occur less frequently and scrapers with a construction which cuts out the abrasion through limited tolerance and abrasion play of its parts and to make this usable for connection chain members in multipart construction.

In accordance with the invention there is provided a chain belt for scraper conveyors, in particular for underground operations, in which a chain belt consisting of one or several parallel round link chains pushes the output material with multipart scrapers which surround at least one horizontal connecting member of each round link chain and lock in position by screw engagement of their parts, comprising one component having a rounded member and the shanks connected thereto with a part of their length, and a congruent further component, and which is housed in a chain bed formed in the horizontal joint faces of the scraper parts, which has channels which liberate the rounded members of the components, which are suspendable with each of their shank connections into a chain end member of a chain strand, according to the flexibility of the suspended vertical chain end members, the shanks of the components being supported form-closed on top of each other with the help of locking surfaces of the shank connections in every direction of motion of the extended chain strand the locking surfaces and the joint faces of the components connected to a horizontal connecting member being housed in the chain channels, on the walls of which are fixed the connecting member with the help of the screw coupling penetrating vertically in the area of the horizontal joint faces of the parts of the scraper.

In this arrangement the propelling forces of the round link chain are removed over the shank projections of the components, so that in extended round link chains a form closure of the connection chain member with the scraper in the direction of motion is not necessary. If as a result of the propelling forces, joint forces arise in the locking surfaces, these are removed through the displacement of the locking and joint surfaces in the chain bed by

the chain channel walls or floors. The arrangement of the locking surfaces makes possible their enlargement without all-round expansion of the shank cross-section, so that the introduction of the shank of the components into the respective end member of the chain strand is not obstructed by the enlargement of the locking surfaces. The face pressures on the locking surfaces are therefore relatively small even on high propelling forces. As the screw coupling vertically penetrates the surfaces of the scraper, on tightening of the screw it not only uses up limited tolerances and if necessary conditional abrasion play between the scraper parts, but also holds the locking surfaces and joint faces of the connection chain members together in their prescribed position.

It is known (DE-AS 27 17 449) in this way to shut out the conditional tolerance and abrasion play of the connection chain member in the chain bed by its spanning with the screw coupling of the scraper parts, whereby through groove and spring arrangements in the joint faces of the scraper parts again an abrasion reduced form closure in the scraper is obtained. From this and from the further advantage of this known scraper, by arrangement of the planes of division of the scraper in one central, horizontal section and in two outer upwardly inclined sections to concentrate the conditional rubbing abrasion through the guiding of the scraper ends to the side profiles of the channel and on the channel floor onto the scraper base portion, the invention can also be made use of because it does not require any, or any substantial, broadening of the channels of the chain bed. Known scrapers of this type however use as connection chain members undivided horizontal round links of the chain strand and therefore do not offer the possibility of connecting together subsequent chain strands with these round links.

While the invention, which brings the surfaces transmitting chain propelling forces to the shank projections of divided connection chain members and houses them together with the joint faces of the connection chain members respectively in the chain channels of the chain bed, achieves on the one hand the usability of the known scrapers for the connection of chain strands and uses on the other hand their advantages in the exclusion of the conditional tolerance spanning of the connection chain members, in order in that way to avoid the previous abrasion on the joint faces and the connection surfaces of the chain bed. The invention therefore has the advantage that it combines a longer life of the components with an improved resistance of the chain strand connections.

Preferably the shanks of the components, which are complementary to a connecting member, have flattened cross-sections and are

assembled in the fixing with hooks which are in each case constructed on a shank connection in the chain member plane, and carry the chain member joint and locking surfaces

5 whereby the hooks are supported with their backs on a channel or side bar wall of the chain bed. This arrangement provides, through a one-sided or partial enlargement of the crosssection dimensions of the shanks of the components leading through the end members and through their particular profiling, an enlargement of the bearing surfaces of the connection chain member. In this way one must admittedly work the parts in the connection to their shaping which however e.g. by planing or impacting can be achieved simply and with great precision.

Conveniently the hook jaw surfaces, which run at right-angles to the hook backs, run at an acute angle to the direction of motion of the extended chain strand. With this arrangement the joint force components are reduced, which exist on the bearing surfaces from the propelling forces, in the plane of the connection chain member and thereby relieve the bearing surfaces in the chain bed and their counter-surfaces on the connection chain member.

Advantageously the connecting member has outwardly arranged hooks which align with the shank connections of the other component and the inner hooks project inwardly with the root of their hook points from the inside of the shank connection of the other component whereby the side bar runs in mirror symmetry to the extended chain. With this arrangement the congruency of the components of a connection chain member is obtained particularly easily. This is the requirement for the simultaneous working of the components in particular according to the above method of working which again forms the requirement for the accuracy of fit of the components and thereby for the stacking of the bearing surfaces in order to prevent local overloading of the bearing surfaces.

The invention will now be described by way of which:

Figure 1 is a side view of a scraper for double centre chain, which is set up in a partial chain break;

Figure 2 shows a horizontal connection chain member in a cross-section running in the chain member plane, with the end members of the chain strand shown in broken lines;

Figure 3 is a view from above on the device of Figure 1, which shows at the left of the centre, the connection chain member in a section according to Figure 2 and a half of the scraper base portion;

Figure 4 is a section along the line A-B of Figure 1;

Figure 5 is a section along the line E-F of Figure 1; whereby the end members of the chain strand are depicted at the left in an

extended chain and at the right in a curved chain;

Figure 6 is a section along the line G-H of Figure 1.

70 The chain belt is shown in the drawings solely with its two centre chains 1, 2 and a multipart scraper 3 which belongs to a scraper conveyor for underground operations. The centre chains 1, 2 are round link chains. The round link chain 1 has an undivided, horizontal chain connection member 4. With the centre round link chain 2 the drawing stems from a chain break which has destroyed the horizontal chain member corresponding to the undivided member 4 between the two end members 5, 6. The two end members 5, 6 are connected to the scraper 3 by a multipart connection chain member 7. For this purpose the scraper has differently constructed chain beds 8, 9 (Figure 1) for the two centre chains 1, 2. The chain bed 8 is constructed as known. The chain bed 9 is described in the following mainly in connection with the multipart connection chain member 7.

90 Such a scraper can be held ready in case of a chain break in the chain strand 2. A correspondingly constructed scraper is advisably held ready in case of a chain break in the chain strand 1. Such scrapers could also be used from the start to connect chain strands together from which the two centre chains 1, 2 are assembled.

The scraper 1 consists of a base portion 10, an upper portion 11 and a screw coupling of which only one screw 12 is shown. Two identical recesses 13, 14 serve for the taking up of the screw coupling. A central boring (15) through both scraper parts 10, 11 terminates on both sides in respective recesses 16, 17 of the scraper base portion 10 or the scraper upper portion 11 and serves for the countersunk arrangement of the screw head or the screw nut.

110 The junction of the two scraper parts runs according to a central horizontal section 18 and an outwardly inclined and upwardly directed section 19, 20. As shown in Figures 4 and 5 a spring 22 jumps out of the joint face 21 of the upper part 11, which fits into a groove 23 which is arranged on the joint face 24 of the scraper base portion 10. As shown at 25 in Figure 4 and at 26 in Figure 5, the joint faces 21 and 24 on the central section 18 of the junction are distanced from each other as soon as the chain beds 8, 9 are spanned by the connection member 7, whereby the joint faces in the sections 19 and 20 lie closer together. It is therefore possible to do away with a conditional tolerance or abrasion play by tightening of the screw coupling 12.

125 The normal, i.e. the known chain bed 8 has two parallel chain channels 27, 28 which are respectively installed with one half 29, 30 or 31, 21 in the base portion 10 or in the upper

portion 11 of the component. The arrangement is chosen such that the horizontal undivided chain member 4 is fixed tensionally on tightening of the screw coupling between the upper and lower part in the chain bed. Since as shown in Figure 3 the upper part 11 is wider than the section of the base portion 10 covered by it, in particular in the region of the chain beds 8, 9, the chain channel halves 31, 32 of the upper portion are longer than the chain channel halves 29, 30 of the base portion. The longer chain channel halves are measured according to the flexibility of the vertical end members 5a, 6a of the chain strand 1.

Due to the shorter construction of the chain channel halves 29, 30 in the base portion 10 this condition is provided in the chain bed 9 without anything further.

The connection chain member 7 (Figure 2) consists of two congruent components 33, 34. Each component contains one of the rounded parts 35, 36 of the connection chain member 7 and a section 37, 38 or 38, 40 of the shanks attached thereto. As shown in Figure 2 the components 33, 34 can be suspended into the end members 5, 6 of the two chain strands preferably with one or other shank section, and brought into the position shown in Figure 2.

If the two components 33, 34 are brought over each other out of the position shown in Figure 2 and they are then moved against each other in their plane, the components 33, 34 can suspend in each other and then take up the position of Figure 3. In the direction of motion of the chain, which is shown by the section line G-H in Figure 3, the locking surfaces 41, 42 of the component 34 then bear on the corresponding locking surfaces of component 33. The surfaces 43 and 44 are joint faces which only bear under chain push which however does not usually occur.

As shown in Figure 3 the described surfaces 41 to 44 of the components 33, 34 completed to a horizontal chain member 7 are housed in the chain channels 45, 46. In the shorter middle part 47 of the base portion 10, in which the lower, deeper, recessed parts 47, 48 of the chain channels 47, 48 lie, the inner walls 49 are constructed on a bar 50 which divides the two chain channels 47, 48 in the base portion from each other. In the upper portion lie the parts 51, 52 of the chain channels 45, 46 and the bar 52 separating them is correspondingly shorter. The floors 53 of the chain channel parts of the upper portion and the floors 54 of the chain channel parts 47, 48 of the lower portion connect the inner walls 49 of the base portion and 55 of the upper portion with the outer walls 56 of the base portion or 57 of the upper portion.

The shanks 37 to 40 of the components 33, 34 completed to the connection chain member 7 have square cross-sections as seen from Figures 1 and 6. In the fixing of Figure 3

the parts 33, 34 are assembled with hooks. The surface 43 borders together with the locking surface 41 the hook jaw 58, whilst the surface 59 connected to the joint face 44 forms the hook backs. The locking surfaces 41, 42 run at right angles to the hook backs 59. As particularly shown in Figures 2 and 3 the planes of surfaces 41, 42 enclose an acute angle with the direction of motion of the chain with extended chain. Therefore an inwardly directed component develops from the chain propelling force removed onto the locking surfaces 41, 42, which holds the surface 59 of the hook backs to the surface 49 of the central bar 50 or the central bar 52'. On the other hand the cross-sections of the chain channels in both component halves are so chosen that the hooks lying opposite each other of the fixed connection chain member 7 support themselves on the outer surfaces 56, 57 of the chain channels.

From this, the connection chain member 7 with a tightened screw coupling 12 is fixed form-closed in the chain channel at right angles through its walls and in longitudinal direction to the end members, and can be distorted as a result of the rounded recesses 61, 61 of the component base portion and 62, 63 of the component part (Figure 5) just as a result of the limited length of the chain channels of the end members 5, 6 in a horizontal as well as vertical plane. The vertical distortion permits the chain strands to guide the drive chain drums which have recesses for the scraper 3.

As also shown in Figure 3 the shank projections 37 to 40 of the components 33, 34 are themselves and in the fixing, in cross-section, flattened, to fit into the right-angled recessed chain channels. The rounded parts 35, 36 are however like the round chain links 4, circular in cross-section whereby the function of the end members 5, 6 in the connection chain member 7 is secured.

Differing from the shown embodiments, scrapers 3 can naturally be provided which in double centre chain belts are prepared in both chain beds 8, 9 for the taking up of connecting rails 7.

Insofar as short strand chains are used, all components are prepared in this way. In long strand chains it is sufficient if one of the number of components corresponding to the number of chain strands is prepared in the manner described.

The chain channels 47, 48 of the chain bed 9 are easy to produce for the remodelled scraper 3, because they are worked by impact. By impact or by planing the hooks 64, 65 of the shank sections 37 to 40 can also be worked.

It is further provided that in the connection member 7 outwardly arranged hooks align with shank projections 38 of the other component 34 and the inner hooks 64 with the

root of their hook points project inwardly from the inside of the shank projections 37 of the other component 34 whereby the bar 50 runs in mirror symmetry to the extended chain 3.

5

CLAIMS

1. A chain belt for scraper conveyors, in particular for underground operations, in which a chain belt consisting of one or several parallel round link chains pushes the output material with multipart scrapers, which surround at least one horizontal connecting member of each round link chain and lock in position by screw engagement of their parts, comprising one component having a rounded member and the shanks connected thereto with a part of their length, and a congruent further component, and which is housed in a chain bed formed in the horizontal joint faces of the scraper parts, which has channels which liberate the rounded members of the components, which are suspendable with each of their shank connections into a chain end member of a chain strand, according to the flexibility of the suspended vertical chain end members, the shanks of the components being supported form-closed on top of each other with the help of locking surfaces of the shank connections in every direction of motion of the extended chain strand and the locking surfaces and the joint faces of the components connected to a horizontal connecting member being housed in the chain channels, on the walls of which are fixed the connecting member with the help of the screw coupling penetrating vertically in the area of the horizontal joint faces of the parts of the scraper.

2. A chain belt according to claim 1 wherein the shanks of the components, which are complementary to a connecting member, have flattened cross-sections and are assembled in the fixing with hooks, which are in each case constructed on a shank connection in the chain member plane, and carry the chain member joint and locking surfaces whereby the hooks are supported with their backs on a channel or side bar wall of the chain bed.

3. A chain belt according to any of claims 1 or 2, wherein the hook jaw surfaces, which run at right-angles to the hook backs, run at an acute angle to the direction of motion of the extended chain strand.

4. A chain belt according to any of claims 1 to 3 wherein the connecting member has outwardly arranged hooks which align with the shank connections of the other component and the inner hooks project inwardly with the root of their hook points from the inside of the shank connection of the other component whereby the side bar runs in mirror symmetry to the extended chain.

5. A chain belt substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

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